The listing of claims presented below replaces all prior versions and listings of claims in the application.

IN THE CLAIMS

Claims 1-51 (cancel)

52. (Currently Amended) A biochip comprising an array of gel cells formed on a substrate by copolymerization of composition K, wherein,

$$K = aA + bB + cC + dD + eE \text{ wherein}$$

A is a monomer based on derivatives of acrylic and methacrylic acids;

B is a water soluble cross-linking agent;

C is a biological modified macromolecule bearing an unsaturated group;

D is a water soluble compound as a medium component for performing a copolymerization;

E is water, and

a, b, c, d, and **e** are percentages (X) of each ingredient in the composition wherein for solids X is m/v×100%; and for liquids X is v/v×100% wherein the total content of monomer and cross-linking agent is in a range from 3 to 40% ($3 \leq$ **(a+b)** $\leq 40\%$), and a monomer to cross-linking agent ratio being within a range of 97:3 to 60:40 and percentages of **C, D,** and **E** ingredients being within a range of

$$0.0001\% \leq \mathbf{c} \leq 10\%;\ 0\% \leq \mathbf{d} \leq 90\%;\ 5\% \leq \mathbf{e} \leq 95\%;$$ and

[[~~(b)~~]] wherein each cell may include an immobilized macromolecule.

53. (Previously Presented) The biochip according to claim 52 wherein said cells form a regular one- or two-dimensional structure (phase).

54. (Previously Presented) The biochip according to claim 54 wherein the composition K is applied to a substrate by using an automatic device equipped with one or more micro dispensers.

55. (Previously Presented) The biochip according to claim 54 wherein the micro dispensers are rod type.

56. (Previously Presented) The biochip according to claim 54 wherein the micro dispensers are contactless micro dispensers of jet type.

57. (Previously Presented) The biochip according to claim 54 wherein the micro dispensers form a regular structure.

58. (Previously Presented) The biochip according to claim 52 wherein one or more substrates including applied droplets of polymerization mixture, during polymerization, are placed into a sealed container under oxygen free inert atmosphere with a controlled humidity.

59. (Previously Presented) The biochip according to claim 58 wherein said container is filled with N_2, Ar, or CO_2 gas.

60. (Previously Presented) The biochip according to claim 59 wherein the gas is continuously or periodically added to the container.

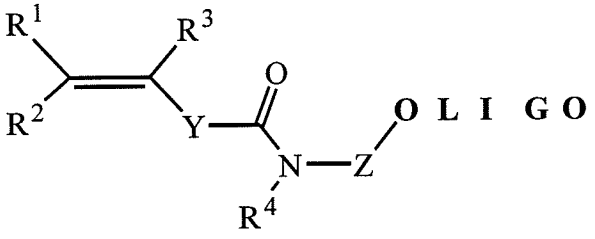
61. (Currently Amended) The biochip according to claim 52 wherein monomer A is one or more of acrylamide, ~~methacrylamide, N-[tris(hydroxymethyl)methyl]acrylamide~~ methacrylamide, N-[tris(hydroxymethyl)methyl]acrylamide, and 2-hydroxyethylmethacrylate.

62. (Previously Presented) The biochip according to claim 52 wherein monomers are used separately or as a mixture.

63. (Currently Amended) The biochip according to claim 52 wherein the cross-linking agent B is one ~~of~~ or more of ~~*N,N'*-methylenbisacrylamide, *N,N'*-ethylenbismethacrylamide~~, *N,N'* methylenebisacrylamide, *N,N'*-ethylenebismethacrylamide, *N,N'*-(1,2-dihydroxyethylene)bisacrylamide, and polyethylene glycol diacrylate.

64. (Previously Presented) The biochip according to claim 52 wherein the cross-linking agents are used separately or as a mixture.

65. (Previously Presented) The biochip according to claim 52 wherein the modified biological macromolecule C is of formula (I):



(I)

wherein

OLIGO represents an oligonucleotide;

R^1, R^2 , and R^3 are different and are selected from H, alkyl C_1-C_6, Ph, and $PhCH_2$- ;

Z is $(CH_2)_nCH(CH_2OH)CH_2OX$ where n is 1-6; or Z is $(CH_2)_r$-OX where r is 2-6;

X is a phosphodiester group binding an unsaturated moiety to 5'- and/or 3'-end of the oligonucleotide;

R^4 represents H, or $(CH_2)_rOH$ where r is 2-6; and

Y is $(p\text{-}C_6H_4)_t$ where t is 0-2.

66. (Withdrawn) The biochip according to claim 52 wherein the modified biological macromolecule C is of formula (II):

5'–X–O–DNA–3'–O–Z **(II)**

wherein

DNA represents a DNA fragment,

X is H or H_2PO_3, and Z represents $–CO–Y–CR^1=CR^2R^3$

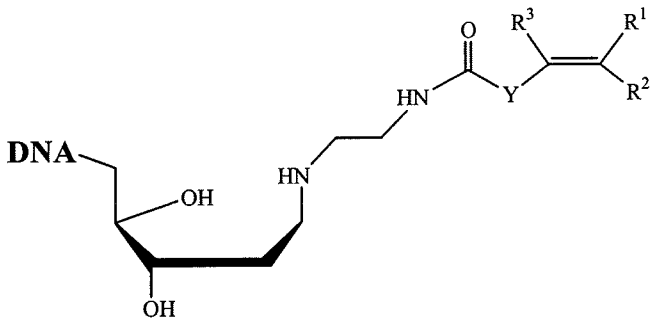
or

X is $–CO–Y–CR^1=CR^2R^3$, and Z is H or H_2PO_3;

R^1, R^2, and R^3 are the same different and are selected from H, alkyl C_1-C_6, Ph, and $PhCH_2–$; and

Y represents $(p\text{-}C_6H_4)_t$ where t is 0-2.

67. (Withdrawn) The biochip according to claim 52 wherein the modified biological macromolecule C is of formula (III);



(III)

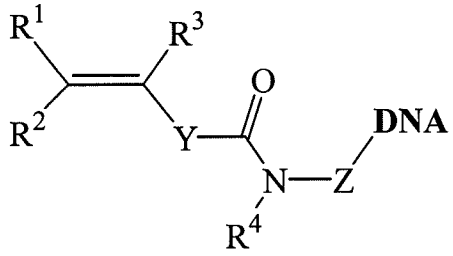
wherein:

DNA represents a DNA fragment;

R^1, R^2, R^3 are the same different and are selected from H, alkyl C_1-C_6, Ph, and $PhCH_2$– ; and

Y is $(p\text{-}C_6H_4)_t$ where t is 0-2.

68. (Previously Presented) The biochip according to claim 52 wherein the modified biological macromolecule C is of formula (IV):



IV

wherein:

DNA represents a DNA fragment;

R^1, R^2, and R^3 are the same different and are selected from H, alkyl C_1-C_6, Ph, and $PhCH_2$– ; and

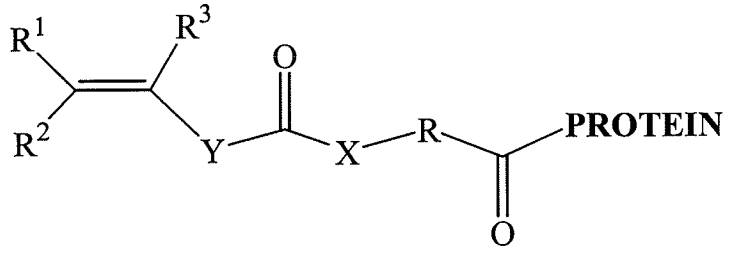
Y is $(p\text{-}C_6H_4)_t$ where t is 0-2;

R^4 represents H, $(CH_2)_rOH$ where r is 2-6; and

Z is $(CH_2)_nCH(CH_2OH)CH_2OX$ where n is 1-6; or $-(CH_2)_r\text{-}OX$ where r is 2-6; and

X is a phosphodiester group binding an unsaturated moiety to 5'- and/or 3'-end of the DNA fragment.

69. (Withdrawn) The biochip according to claim 52 wherein the modified biological macromolecule C is a protein of formula (V):



V

wherein

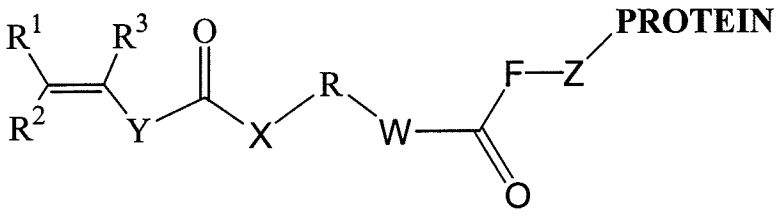
R^1, R^2, and R^3 are the same different and are selected from H, alkyl C_1-C_6, Ph, and $PhCH_2$–;

X is NH, O, CH_2, or S;

Y is $(p\text{-}C_6H_4)_t$ where t is 0-2; and

R is $(CH_2)_s$, or $(CH_2CH_2O)_s$, where s is 1- 20.

70. (Withdrawn) The biochip according to claim 52 wherein the modified biological macromolecule C is a protein of formula (VI):



VI

wherein

R^1, R^2, and R^3 are the same different and are selected from H, alkyl C_1-C_6, Ph, and $PhCH_2$- ;

X is NH, O, S, or CH_2 ;

Y is $(p\text{-}C_6H_4)_t$, where t is 0-2;

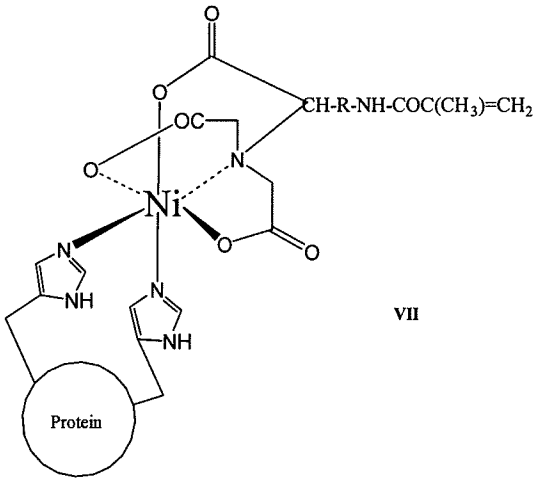
R is $(CH_2)_s$, or $(CH_2CH_2O)_s$, where s is 1-20;

W is NH, O, or CH_2;

F is $(CH_2)_x$, where x is 1 or 2; and

Z is NH or S.

71. (Withdrawn) The biochip according to claim 52 wherein the modified biological macromolecule C is a protein of formula (VII):



VII

wherein R represents $(CH_2)_s$, or $(CH_2CH_2O)_s$, where s is 1–20.

72. (Previously Presented) The biochip according to claim 52 wherein D is a water soluble high-boiling organic compound.

73. (Previously Presented) The biochip according to claim 72 where the water soluble high-boiling organic compound is *N,N*-dimethylformamide, dimethylsulfoxide or both.

74. (Previously Presented) The biochip according to claim 52 wherein use is made of a water soluble polyhydric compound as a component of the medium for performing the photo initiated polymerization.

75. (Previously Presented) The biochip according to claim 74 wherein the one or more water soluble polyhydric compound is selected from glycerol, sucrose and polyvinyl alcohol.

76. (Withdrawn) A method for performing PCR over the biochip according to claim 52 comprising the steps of:

a) adding amplification solution, forward (F) and reverse (R) primers of samples of nucleic acids under investigation; and

b) incubating the biochip under conditions of a thermocycling treatment providing a realization of PCR-amplification.

77. (Withdrawn) A method for performing the PCR over the biochip according to claim 52 comprising the steps of:

a) incubating isothermally the biochip with hybridization solution comprising the samples of nucleic acids under investigation to perform their hybridization with primers immobilized (synthetic oligonucleotides);

b) incubating isothermally the biochip, comprising the nucleic acids being hybridized with primers immobilized, in the amplification solution containing forward (F) and reverse (R) primers;

c) replacing the amplification solution out of biochip gel elements with hydrophobic liquid (mineral oil) which completely isolates biochip cells with each other, and

d) incubating the biochip under conditions of a thermocycling treatment providing a realization of PCR-amplification.